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Automatic Gravimetric Filling Instruments

Part 1 Terminology and Definitions

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FOREWORD

This Indian Standard (Part 1) was adopted by the Bureau of Indian Standards after the draft finalized by the Weights and Measures Sectional Committee and approval of the Production and General Engineering Division Council.

In the formulation of this Indian Standard, considerable assistance has been derived from the standards of 'The Legal Metrology (General) Rules, 2011, Seventh schedule heading — The automatic gravimetric filling instruments Part 1'.

This Indian Standard is published in two parts. The other part in this series is:

Part 2	Metrological and technical requirements

Indian Standards

AUTOMATIC GRAVIMETRIC FILLING INSTRUMENTS

PART 1 TERMINOLOGY AND DEFINITIONS

1 SCOPE

This Indian Standard (Part 1) covers the terminology and definitions for automatic gravimetric filling instruments, the requirements for the same dealt by Part 2 of this standard.

2 GENERAL DEFINITIONS

For the purpose of this standard, the following definitions shall apply:

2.1 Weighing Instrument — Measuring instrument that serves to determine the mass of a load by using the action of gravity on that load. According to its method of operation, a weighing instrument is classified as automatic or non-automatic.

2.2 Automatic Weighing Instrument — An instrument which weighs without the intervention of an operator and follows a predetermined programmed of automatic process characteristic of the instrument.

2.3 Automatic Gravimetric Filling Instrument — An instrument which fills containers with predetermined and virtually constant mass of product from bulk by automatic weighing, and which comprises essentially an automatic feeding device or devices associated with one or more weighing units and the appropriate control and discharge devices.

2.3.1 *Associative (Selective Combination) Weigher* — Automatic gravimetric filling instrument comprising one or more weighing units and which computes an appropriate combination of the loads and combines them for subsequent discharge as a fill.

2.3.2 *Cumulative Weigher* — Automatic gravimetric filling instrument with one weighing unit with the facility to effect the fill by more than one weighing cycle.

2.3.3 *Subtractive Weigher* — Automatic gravimetric filling instrument for which the fill is determined by controlling the output feed from the weigh hopper.

2.4 Fill — One or more loads discharged into a single container to make up the predetermined mass.

2.5 Electronic Instrument — An instrument equipped with electronic devices.

2.6 Control Instrument — A weighing instrument used to determine the mass of the test fills delivered by the filling instrument.

3 CONSTRUCTION

In this standard, the term device is applied to any part which uses any means to perform one or more specific functions.

a) Principal parts, and
b) Weighing units.

   A device which provides information on the mass of the load to be measured. The device may consist of all or parts of non-automatic weighing instruments.

   1) Local receptor — Part of measurement intended to receive the load.
   2) Feeding device — Device which provides the supply of the product from bulk to the weighing unit. It may operate in one or more stages.
   3) Control devices .
   4) Other devices:
      i) *Feed control device* — Device which regulates the rate of the feed of the feeding device.
      ii) *Fill setting device* — Device which allows the setting of the pre-set value.
      iii) *Final feed cut off device* — Device which controls the cut off the final feed so that the average mass of the fills corresponding to the pre-set value. The device may include an adjustable compensation for the material in flight.
      iv) *Correction device* — Device, which automatically corrects the setting of the filling instrument.

3.1 Electronic Parts

3.1.1 *Electronic Device*

A device comprising electronic assemblies and performing a specific function. Electronic devices are usually manufactured as separate units and capable of being independently tested.

3.1.2 *Electronic Sub-assembly*

A part of an electronic device employing electronic components and having a recognizable function of its own.

3.1.3 *Electronic Components*

The smallest physical entity that uses the electron or hole conduction in semi-conductors gases or in vacuum.

3.2 Indicating Device

The part of a measuring instrument that displays an indication.

NOTES:

1 For a weighing instrument, the indicating device is a set of components, which displays the value, in units of mass, of the result of a weighing operation.

2 For filling instrument the indicating device may indicate either the mass of the load or difference between the mass and the preset value.

3.3 Ancillary Devices

3.3.1 *Zero Setting Device*

A device for setting the indicating device to zero when the load receptor is empty.

3.3.1.1 *Non automatic zero setting device*

A device for setting the indicating device to zero by an operator.

3.3.1.2 *Semi-automatic zero setting device*

A device for setting the indicting device to zero automatically following a manual command.

3.3.1.3 *Automatic zero setting device*

A device for setting the indicating device to zero automatically without the intervention of an operator.

3.3.2 *Tare Device*

A device for setting the indication to zero when a load is on the load receptor:

a) Without altering the weighing range for net loads (additive tare device); or
b) Reducing the weighing range for net loads (subtractive tare device).

4 METROLOGICAL CHARACTERISTICS

4.1 Scale Interval (*d*)

The expressed in units of mass, of the difference between:

a) the values corresponding to two consecutive scales mark for analogue indication; and
b) two consecutive indicated values for digital indication.

4.2 Reference Particle Mass of a Product

Mass equal to the mean of ten of the largest elementary particles or pieces of the product taken from one or more loads.

4.3 Pre-set Value

Value, expressed in units of mass, preset by the operator by means of the fill setting device, in order to define the nominal value of the fills.

4.4 Static Set Point

Value of the test weights or masses, which, in static test, balance the value, selected on the indication of the fill setting device.

4.5 Weighing Cycle

The sequence of the operation which includes:

a) Delivery of the material to the load receptor;
b) A weighing operation; and
c) The discharge of a single discrete load.

4.6 Final Feed Time

Time taken to complete the last stage of delivery of the product to a load receptor.

4.7 Minimum Capacity (*Min*)

Smallest discrete load that can be weighed automatically on a load receptor

4.8 Maximum Capacity (*Max*)

The largest discrete load that can be weighed automatically on a load receptor

4.9 Warm up Time

The time between the moment power is applied to an instrument and the moment at which the instrument is capable of complying with the requirements.

4.10 Average Number of Loads per Fills

Half the sum of the maximum and minimum number of loads per fill that can be set by the operator or, in cases where the number of loads per fill is not directly determined by the operator, either the means of the actual number of loads per fill (if known) in a period of normal operation, or the optimum number of loads per fill as may be specified by the manufacturer for the type of product which is to be weighed.

4.11 Rated Minimum Fill

The rated value of the fill below which the weighing results may be subject to errors outside the limits specified in this part.

4.12 Minimum Discharge

The smallest load that can be discharged by a subtractive weigher.

5 INDICATIONS AND ERRORS

5.1 Method of Indication

5.1.1 *Analogue Indication*

An indication allowing the evaluation of equilibrium position to a fraction of the scale interval.

5.1.2 *Digital Indication*

An indication in which the scale mark comprises a sequence of an aligned figure that do not permit interpolation to fraction of a scale interval.

5.2 Errors

5.2.1 *Error of Indication*

The indication of an instrument minus the (conventional) true value of the mass.

5.2.2 *Intrinsic Error*

The error of an instrument under reference conditions.

5.2.3 *Initial Intrinsic Error*

The intrinsic error of an instrument as determined prior to performance and span stability tests.

5.2.4 *Fault*

The difference between the error of indication of an instrument and the intrinsic error.

NOTE — Principally, a fault is the result of an undesired change of data contained in an electronic instrument.

5.2.5 *Significant Fault*

A fault greater than 0.25 of the maximum permissible deviation of each fill [as specified in sub-paragraph (2) of para 2] for an in-service verification, for a fill equal to the rated minimum fill.

NOTE — The following are not considered to be significant faults even when they exceed the value defined above.

a) Faults arising from simultaneous and mutually independent causes in the instrument.

b) Faults implying the impossibility to perform any stage of operation.

c) Faults being so series that they are bound to be noticed by an operator.

d) Transitory faults being momentary variations in the indication or operation which cannot affect the final results of the automatic cycles.

5.2.6 *Span Stability*

The capability of an instrument to maintain the difference between the indication of weight at maximum capacity and the indication at zero within specified limits over a period of use.

5.3 Reference Value for Accuracy Class

The value of accuracy class determined by static testing of the weighing unit during influence quantity testing at pattern approval stage. The reference value for accuracy class in equal to the best accuracy class for which the instrument may be verified for operational use.

6 INFLUENCES AND REFERENCE CONDITIONS

6.1 Influence Quantity

A quantity, which is not the subject of the measurement by which, influences the value of measured or the indication of the instrument.

6.1.1 *Influence Factor*

An influence quantity having a value within the specified rated operating conditions of the instrument.

6.1.2 *Disturbance*

An influence quantity having a value within the limits specified in the part but outside the rated operating conditions of the instrument.

6.2 Rated Operation Conditions

Conditions of use, giving the ranges of the measured and the influence quantities for which the metrological characteristics are intended to lie within the maximum permissible deviation specified.

6.2.1 *Reference Conditions*

A set of specified values of influence factors fixed to ensure valid inter-comparison of the results of measurements.

7 TESTS

7.1 Material Test

A test carried out off a complete instrument using the type of material, which it is intended to weigh.

7.2 Simulation Test

A test carried out on a complete instrument or a part of an instrument in which any part of the weighing operation is simulated.

7.3 Performance Test

A test to verify whether the equipment under test (EUT) is able to accomplish its intended.

7.4 Span Stability Test

A test to verify that the EUT is capable of maintaining its performance characteristics over period of use.

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